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Sustainable development: promotion of new and renewable sources of energy

Promotion of new and renewable sources of energy

Report of the Secretary-General

Summary

New and renewable sources of energy are perceived not only as an important and valuable option for energy supply, but also as key resources for addressing global challenges, including universal energy access, energy security, climate change, and ultimately poverty eradication and sustainable development. For the first time in human history, there have been two straight years of decoupling between emissions and gross domestic product growth, a development in which renewable energy has played an important part. Continuing technological advances, rapidly falling costs and successful deployment and use of renewable energy systems in many developed and developing countries have demonstrated their potential to satisfy energy requirements and to replace other energy sources. As renewable energy markets and industries mature, new opportunities arise, but at the same time different challenges and uncertainties appear. Newly installed renewable energy capacity has reached new record levels as investment has strongly rebounded. In addition, various renewable energy technologies have reached historic cost-competitiveness, thus putting them on a par with conventional power generation. Nevertheless, uncertainty over the future of renewable sources of energy remains as oil and natural gas prices have plummeted over the past year. The year 2015 ended with two crucial initiatives in support of the promotion of renewable energy: the adoption of the 2030 Agenda for Sustainable Development, including a stand-alone goal on energy, and the adoption of the Paris Agreement by the Conference of the Parties to the United Nations Framework Convention on Climate Change.

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I. Introduction

1. In recent years, the importance of promoting new and renewable sources of energy has been reaffirmed at the United Nations. The Secretary-General's Sustainable Energy for All (SE4ALL) initiative, founded in 2011, has three energy objectives, one of which is to double the share of renewable energy in the global energy mix. This was followed, in June 2014, by the General Assembly unanimously declaring 2014-2024 as the Decade of Sustainable Energy for All. That initiative has brought together top-level leadership from all sectors of society — governments, the private sector and civil society — and sparked significant commitments to action that strongly support the increased use of new and renewable energy sources.

2. One outcome of the SE4ALL initiative is the development of the Global Tracking Framework, headed by the World Bank, the International Energy Agency (IEA) and the Energy Sector Management Assistance Programme (ESMAP). This multi-agency partnership effort has established baseline energy data and provides regular biannual updates on trends in energy access, renewable energy and energy efficiency.

3. Energy was also central to discussions during the negotiations on the post-2015 development agenda that culminated with the adoption of resolution 70/1, the 2030 Agenda for Sustainable Development, by the General Assembly on 25 September 2015, as a direct outcome of the United Nations Conference on Sustainable Development (Rio+20) in 2012. The 2030 Agenda contains 17 Sustainable Development Goals and 169 targets. Goal 7 aims to "Ensure access to affordable, reliable, sustainable and modern energy for all". Three corresponding targets stipulate that by 2030 universal access to affordable, reliable and modern energy services be ensured, the share of renewable energy in the global energy mix be increased substantially, and the global rate of improvement in energy efficiency be doubled. The targets are supplemented by two specific targets on means of implementation.

4. Then, in December 2015, the Parties to the United Nations Framework Convention on Climate Change reached a landmark agreement, charting a fundamentally new course for global climate efforts. The Parties reaffirmed their commitment to limiting temperature increase to well below 2 degrees Celsius, while pursuing efforts to limit the increase to 1.5 degrees. The agreement also established binding commitments by all parties to make "nationally determined contributions" and to pursue domestic measures aimed at achieving them. New and strengthened initiatives also came from non-State actors, including cities, States and regions, companies and investors. The founder of Microsoft, Bill Gates, and 27 other major investors in 10 countries launched the Breakthrough Energy Coalition to steer more private capital into clean energy deployment. Additionally, the Compact of Mayors declared that the collective commitment of more than 360 cities was on track to deliver half of the world's potential urban greenhouse gas emissions (GHG) reductions by 2020.

5. In its resolution 69/225 of 19 December 2014, the General Assembly called upon Governments, as well as relevant international and regional organizations and other relevant stakeholders, to combine, as appropriate, the increased use of new and renewable energy resources, more efficient use of energy, greater reliance on

advanced energy technologies, including cleaner fossil fuel technologies, and the sustainable use of traditional energy resources, which could meet the growing need for energy services in the longer term to achieve sustainable development.

6. In the same resolution, the General Assembly requested the Secretary-General to submit to it at its seventy-first session a report on the promotion of new and renewable sources of energy. The present report is submitted pursuant to that request.

II. Overview of new and renewable sources of energy

A. Status

7. The role of renewable energy in global energy supply continues to increase in both developing and developed countries. New and renewable sources of energy have become accepted not only as feasible and important energy supply options, but also as key resources for addressing global challenges, including universal energy access, energy security, climate change, and ultimately poverty eradication and sustainable development.

8. There are signs now that global economic growth is starting to decouple from energy-related emissions. For the second year in a row, the global economy grew, by around 2.4 per cent, in 2015, while CO_2 emissions from the energy sector stayed flat.[1] IEA pointed to a surge in renewables as a key factor, noting that they accounted for 90 per cent of new electricity generation in 2015.[2]

9. Nevertheless, major challenging economic and technological factors are still affecting the large-scale deployment of renewable energy. They include the need to further: (a) reduce costs through promotion, technological improvements and scale-up; (b) create a flexible investment environment in many countries; (c) integrate renewable energy technologies into energy systems; (d) enhance research and development; and (e) ensure the sustainability of renewable energy technologies.[3]

10. Figure I shows fuel shares in global final energy consumption in 2014. The total share of renewable energy reached 19.2 per cent, up from 18 per cent in 2010, and growth in capacity and generation continued in 2015.[4] That refers to all forms of consumption, including transport, heating, cooling, cooking and power generation. Traditional biomass accounts for 8.9 per cent of current renewable energy consumption. Modern renewable energy sources make up only 10.3 per cent of total consumption. That includes 4.2 per cent from sustainable biomass, geothermal and solar for heating purposes, 3.9 per cent from hydropower, 1.4 per cent from wind, solar and geothermal for power generation, and 0.8 per cent from biofuels for transport.

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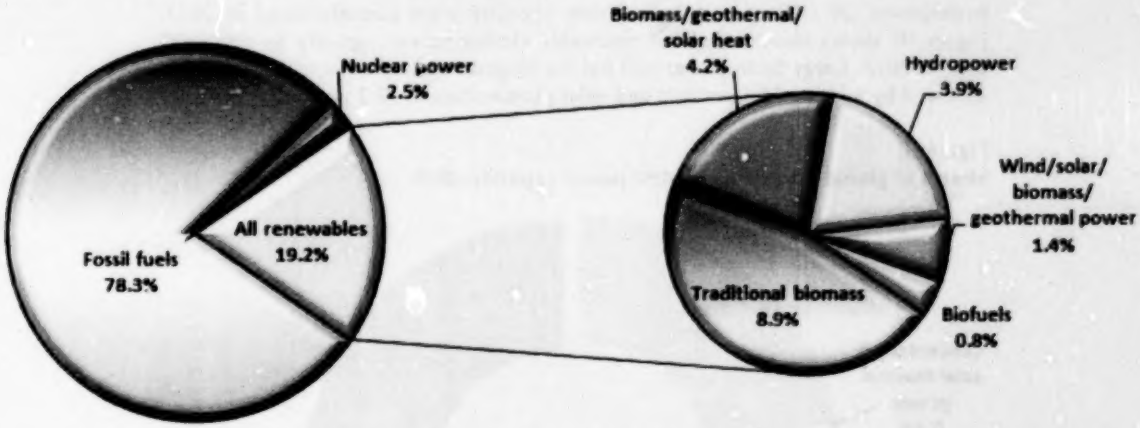
[1] World Bank Group, *Global Economic Prospects, January 2016: Spillovers amid Weak Growth* (Washington, D.C., 2016).

[2] International Energy Agency, Press Release, "Decoupling of global emissions and economic growth confirmed" (Paris, 2016).

[3] International Institute for Applied Systems Analysis, *Global Energy Assessment: Toward a Sustainable Future* (Cambridge, Cambridge University Press, 2012), and the International Institute for Applied Systems Analysis, Laxenburg, Austria.

[4] Renewable Energy Policy Network for the 21st Century (REN21), *Renewables 2016: Global Status Report* (Paris, 2016).

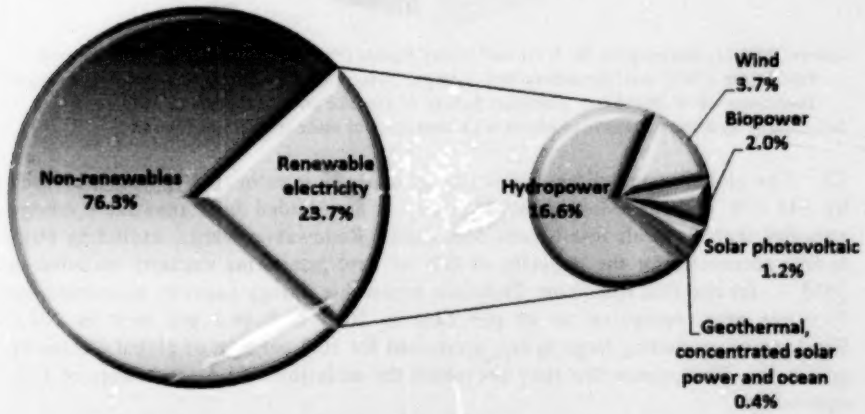
Figure I
Fuel shares in global final energy consumption, 2014



Source: Renewable Energy Policy Network for the 21st Century (REN21), *Renewables 2016: Global Status Report* (Paris, 2016).

11. Figure II shows fuel shares in global electricity generation for the end of 2015. The share of renewables in overall global electricity generation rose to 23.7 per cent from 20 per cent in 2011. Hydropower has the largest share at 16.6 per cent, followed by wind, biofuels and solar photovoltaic, respectively. Electricity generated globally by renewable energy sources other than hydropower represents only 7.3 per cent.

Figure II
Fuel shares in global electricity generation for the end of 2015

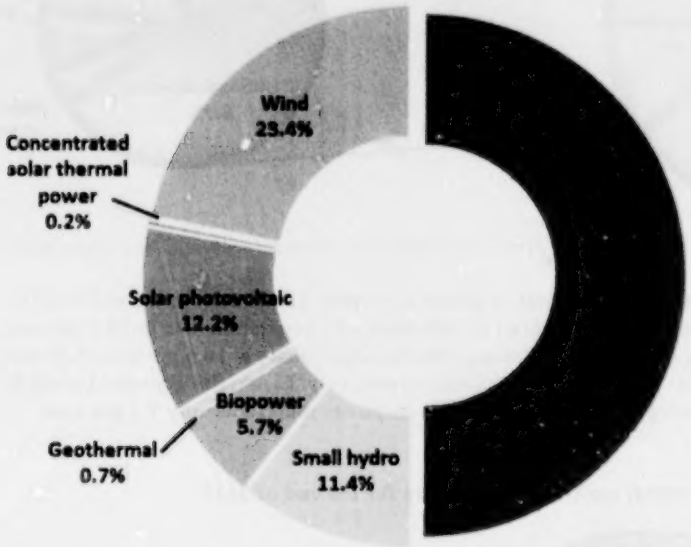


Source: REN21, *Renewables 2016: Global Status Report* (Paris, REN21 Secretariat, 2016).

12. In terms of electric power capacity, the overall global renewable electric power capacity increased to 1,849 gigawatts (GW) in 2015, from 1,701 GW in 2014, the largest annual increase ever. The overall increase in 2015 is the result of market advancements for all renewable energy technologies, but especially for solar

photovoltaic and wind. The solar photovoltaic market was up 25 per cent over 2014 to a record 50 GW, lifting the global total to 227 GW, whereas globally, a record of 63 GW of wind power was added for a total of about 433 GW. In the case of hydropower, 28 GW of new hydropower capacity were commissioned in 2015.[5] Figure III shows shares of global renewable electric power capacity by renewable source, 2015. Large hydropower still has the largest capacity share at 53.6 per cent, followed by wind at 23.4 per cent and solar photovoltaic at 12.2 per cent.[6]

Figure III
Shares of global renewable electric power capacity, 2015



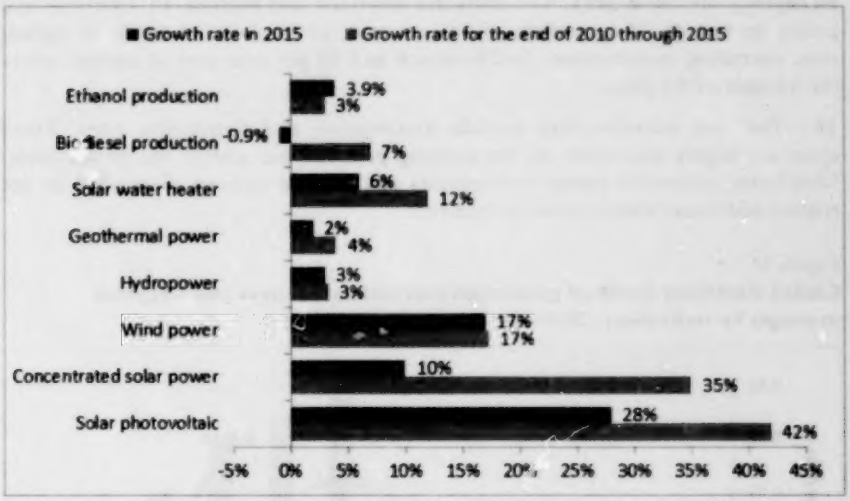
Source: REN21, *Renewables 2016: Global Status Report* (Paris, 2016). Large hydro data were taken from UNEP and Bloomberg New Energy Finance, *Global Trends in Renewable Energy Investment 2016* (Frankfurt, Frankfurt School of Finance and Management, 2016).
Note: Large hydropower refers to plants with capacities of more than 50 megawatts.

13. The global installed renewable energy capacity is estimated to have increased by 148 GW in 2015. More power capacity is now added from renewable energy annually than from all fossil fuels combined.[5] Renewable energy, excluding large hydro, accounted for the majority of GW of new generating capacity installed in 2015 — for the first time ever. This new renewable energy capacity accounted for 53.6 per cent, compared to 49 per cent in 2014 and 40.2 per cent in 2013. Renewables, excluding large hydro, accounted for 10.3 per cent of global electricity generation. This means that they prevented the emission of 1.5 gigatonnes of CO_2 equivalent.[7]

[5] REN21, *Renewables 2016: Global Status Report* (Paris, 2016).
[6] Large hydropower in the present report refers to hydropower plants with capacities of more than 50 megawatts.
[7] UNEP and Bloomberg New Energy Finance, *Global Trends in Renewable Energy Investment 2016* (Frankfurt, Frankfurt School of Finance and Management, 2016).

14. Figure IV shows the annual growth rates of renewable energy capacity and biofuel production for the five-year period 2010-2015 and for the year 2015.

Figure IV
Average annual growth rates of renewable energy capacity and biofuel production, 2010-2015 and 2015



Source: REN21, *Renewables 2016: Global Status Report* (Paris, 2016).

15. Solar photovoltaic and concentrated solar power experienced the highest growth rates during the period 2010-2015 at an average of 42 per cent and 35 per cent, respectively. However, compared to the last five-year average, capacity growth in 2015 significantly slowed down for solar photovoltaic, concentrated solar power, solar water heating and biodiesel, with the latter experiencing a negative growth. In terms of installed capacity, including hydro, China led the world in total renewable energy capacity at the end of 2015, followed by the United States of America, Brazil and Germany. In per capita terms, excluding hydropower, the world leader is Denmark, followed by Germany, Sweden and Spain.[5]

16. For the first time in history, total investment in renewable power and fuels in developing countries in 2015 exceeded that in developed economies. The developing world committed a total of $156 billion, up 19 per cent compared to 2014. China played a dominant role, increasing its investment by 17 per cent to $102.9 billion, accounting for 36 per cent of the global total. Renewable energy investment also increased significantly in India, South Africa, Mexico and Chile. Other developing countries investing more than $500 million in renewables in 2015 included Morocco, Uruguay, the Philippines, Pakistan and Honduras.[5]

B. Costs

17. Renewable energy technologies today are more cost-competitive than ever before, as technology and installation costs of a range of renewable energy

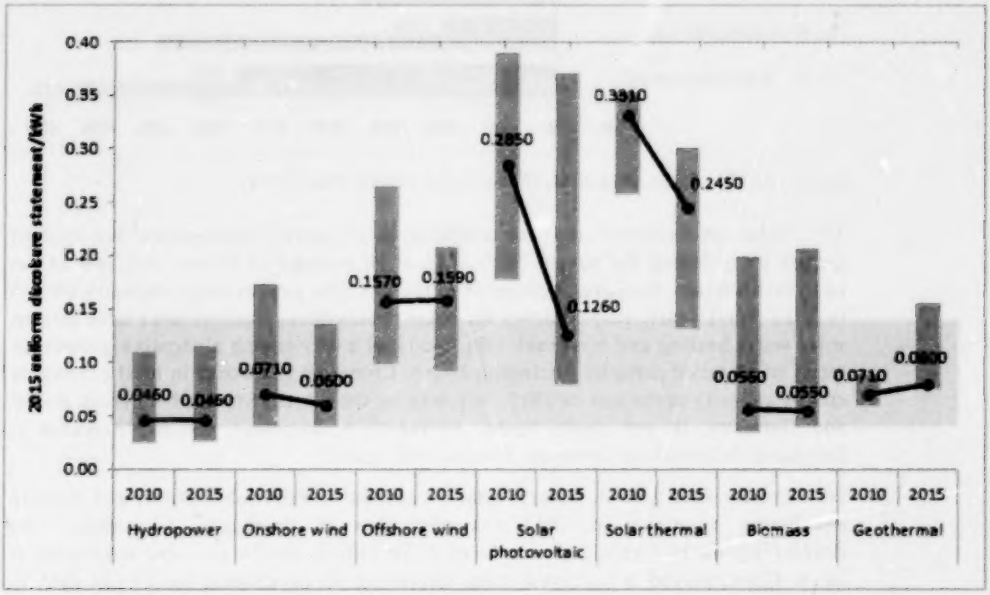
technologies have continued to fall in 2015 and 2016. The cost of renewable energy generation does not only depend on the technology employed, but also on the plant's capacity, location and surrounding infrastructure. The cost-effectiveness of renewable energy technologies in different areas also depends on the availability and quality of the respective resource.

18. Figure V presents estimated ranges for electricity generation costs by technology for 2010-2015. The costs are levelized and exclude all subsidies and policy incentives. They include equipment cost, performance, balance of system cost, operation, maintenance, fuel/feedstock and 10 per cent cost of capital across the lifespan of the plant.

19. The cost estimates also exclude transmission and distribution costs. These costs are highly dependent on the existing grid and the size of the power plant. Distributed renewable energy technologies and off-grid systems most often do not require additional transmission investments.

Figure V

Global electricity levelized generation cost estimate ranges and weighted averages by technology, 2010-2015



Source: International Renewable Energy Agency (IRENA) database, "Trends in Global Renewable Energy Levelised Cost of Electricity 2010-2015 (Ranges and Weighted Averages)", Chart (Abu Dhabi, 2015).

Note: The electricity cost estimates include 10 per cent capital cost.

20. Renewable energy today represents one of the most cost-effective solutions for off-grid areas and has a cost advantage over diesel-fired power generation. Given that more than one billion people worldwide lack access to electricity and many of them live in isolated rural areas, which are unlikely to be connected cost-effectively

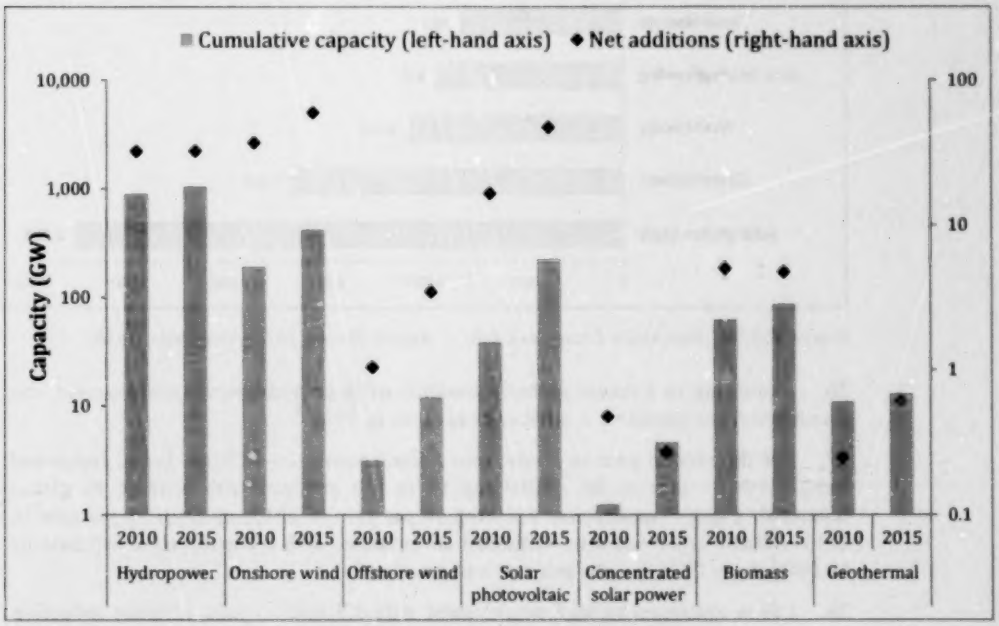
or promptly to the grid, stand-alone (off-grid) renewable energy solutions constitute one the most promising solutions for these areas.

21. The competitiveness of renewable power generation technologies has reached historic levels; onshore wind power, solar photovoltaic and concentrated solar power installed costs have continued to fall as their performance has improved, significantly lowering the cost of electricity from these sources.

22. Onshore wind today is one of the most cost-competitive sources of electricity generation, and its levelized cost of electricity is in the same range or even lower than that of fossil fuels. The best wind projects around the world now consistently deliver electricity at $0.06 per kWh without financial support.

23. Figure VI shows that wind and solar photovoltaic have offset the stagnation of the net capacity additions in other renewables.

Figure VI
Renewable capacity: cumulative capacity and net additions, 2010-2015



Source: IRENA, *Installed Renewable Energy Power Capacity* (Abu Dhabi, 2016).

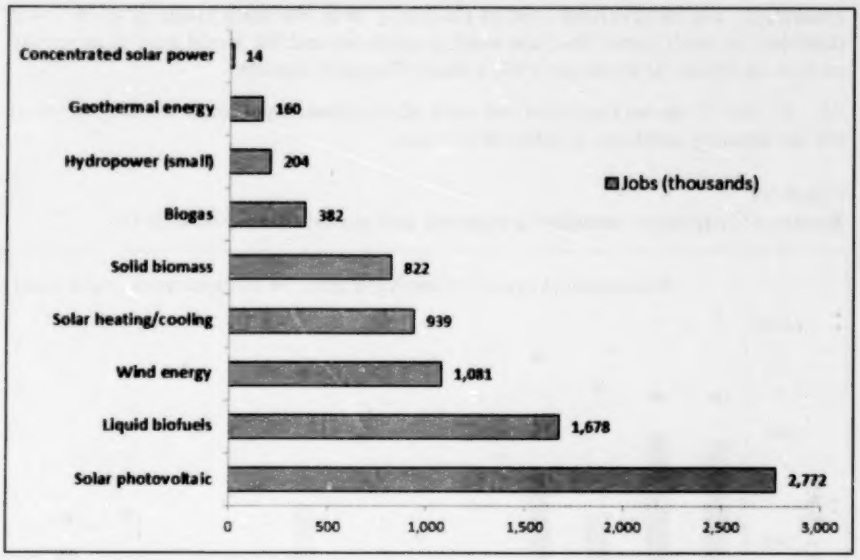
Employment

24. The latest estimates of employment in the renewable energy sector, excluding large hydropower, indicate that in 2015 roughly 8.1 million people worked directly and indirectly for the industry around the world. That constitutes a 5 per cent increase from the previous year.[8]

[8] IRENA, *Renewable Energy and Jobs — Annual Review 2016* (Abu Dhabi, 2016).

25. Figure VII shows the distribution of jobs in the different sectors. Solar photovoltaic was the largest renewable energy employer with 2.8 million jobs worldwide, an 11 per cent increase over 2014. Solar photovoltaic employment grew in Japan and the United States of America, stabilized in China, and continued decreasing in the European Union.

Figure VII
Estimated jobs in renewable energy worldwide by industry, 2015



Source: IRENA, *Renewable Energy and Jobs — Annual Review 2016* (Abu Dhabi, 2016).

26. According to a recent global estimation of large hydropower employment, the sector provided another 1.3 million direct jobs in 2015.[8]

27. For the second year in a row, four Asian countries — China, India, Japan and Bangladesh — are on the global top-10 in job creation with a share of global renewable energy employment reaching 60 per cent in 2015, up from 51 per cent in 2013. African countries also witnessed an increase, with a conservative estimate of 61,000 jobs in 2015 as new projects came online.[8]

28. China continued to lead employment with 3.5 million jobs, a minor reduction of 2 per cent over the previous year, as more than a third of the additions in terms of renewable energy capacity took place there.

29. The European Union as a whole remained the second largest renewable energy employer with 1.17 million, followed by Brazil, the United States and India. Within the European Union, 355,000 jobs are located in Germany alone and 170,000 in France.

30. Brazil's employment in renewable energy is found in bioenergy and large hydropower, while in China 1.65 million people are employed by the domestic solar photovoltaic industry.[8]

Other factors affecting renewable energy growth

31. In 2014, global fossil fuel consumption subsidies amounted to $493 billion, down from $548 billion in 2013, but still over four times the value of subsidies to renewable energy.[9] By factoring in externalities, global total post-tax subsidies in both advanced and developing economies and among oil-producing and non-producing countries alike have been projected to reach $5.3 trillion or 6.5 per cent of global gross domestic product (GDP) in 2015.[10] In terms of percentage of regional GDP, this is mainly due to the high coal consumption in emerging and developing Asia and Commonwealth of Independent States (CIS) countries, where coal subsidies were projected to reach $2.5 trillion in 2015 or 3.1 per cent of global GDP.

32. Fossil fuel subsidies, in particular, hamper renewable energy development and create an uneven playing field. The largest externalities are typically fiscal, environmental and welfare impacts from energy subsidies at the global and local levels. If they are not factored into the price of fossil fuel power generation, the results are distorted markets and barriers for new entrants such as renewables. Overcoming these market imbalances requires coherent policies and a reduction of fossil fuel subsidies. Recent changes prove reform is possible: low oil prices give net importers the room to reform and reinforce the need for exporters to do so.

33. Renewable energy subsidies can help new technologies to penetrate markets and create economies of scale. In 2015, significant strides were made in the financing of renewable energy technologies on account of climate change policies and improved cost-competitiveness. The Paris Agreement universally adopted in December 2015 by all Parties to the United Nations Framework Convention on Climate Change provides policy signals[11] to help accelerate the low-carbon transformation of the global economy. However, many countries are currently cutting back on renewable energy subsidies owing to their individual economic and political considerations and as renewable energy technologies become increasingly cost-competitive without government support.

34. Adding to other factors affecting renewable energy growth since 2014, the oil price sharply declined by 76 per cent to $27.10 per barrel in early 2016. In Europe, the Amsterdam-Rotterdam-Antwerp coal contract dropped from $84 per tonne to $36.30, whereas the natural gas price fell from $4.50 per MMBtu to $1.91 during the same time period.[5]

35. However, competition between fossil fuels and renewables depends on factors other than fossil fuel prices, such as location. Renewables may have their own advantages because of rapid growth and plentiful financing options.

36. The share of renewables in electricity generation is continuously growing; however, the status of the transport sector is less encouraging. To date, the primary energy supply used in the transport sector has been liquid fossil fuels. The demand for liquid biofuels (such as ethanol) in transport has been on the incline, alongside a growth in private vehicles. In some European countries, the United States and

[9] International Energy Agency, *World Energy Outlook 2015* (Paris, OECD/IEA, 2015).

[10] D. Coady, I. Parry, L. Sears and B. Shang, *IMF Working Paper: How Large Are Global Energy Subsidies?* (International Monetary Fund, WP/15/105, May 2015).

[11] UNEP and Bloomberg New Energy Finance, *Global Trends in Renewable Energy Investment 2016* (Frankfurt, Frankfurt School of Finance and Management, 2016).

Brazil, biofuel's contribution in road transport fuel is considerably high, reaching 20 per cent in 2014.

37. Beyond biofuels, trends in the development of gaseous fuels and electricity have continued to open up opportunities for the integration of renewables into the transport sector. Global electric vehicle (EV) sales were just under 540,000 in 2015, a roughly 70 per cent increase since 2014. Norway saw 71 per cent growth in EV sales in 2015. Overall, the accelerated growth is a good sign for EV adoption. Nonetheless, the share of the total global auto market held by EVs and plug-in hybrid electric vehicles was still only 0.6 per cent in 2015.

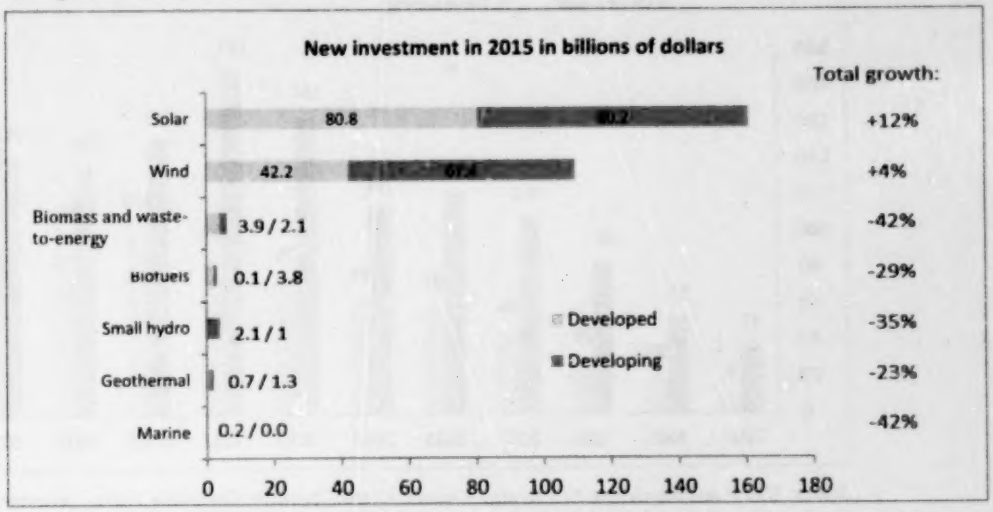
C. Investments

38. In 2015, the global investment in renewables rose by 5 per cent to $286 billion, thus reaching a new record high compared to total investments of $273 billion in 2014. That record was achieved despite exchange rate shifts that depressed the dollar value of investments in other currency zones, and despite sharp falls in oil, coal and gas prices that enhance the competitive position of fossil fuel generation.[12]

39. Figure VIII shows new investment in renewable energy in 2015 and net changes from 2014. Investments increased for solar and wind, while the decreasing trend persisted for all other smaller sectors. Investments in solar increased by 12 per cent and in wind by 4 per cent.

[12] Note that investment figures from REN21, *Renewables 2016: Global Status Report* (Paris, 2016) do not cover large hydropower.

Figure VIII
Global new investment in renewable energy by sector in 2015 and percentage change from 2014



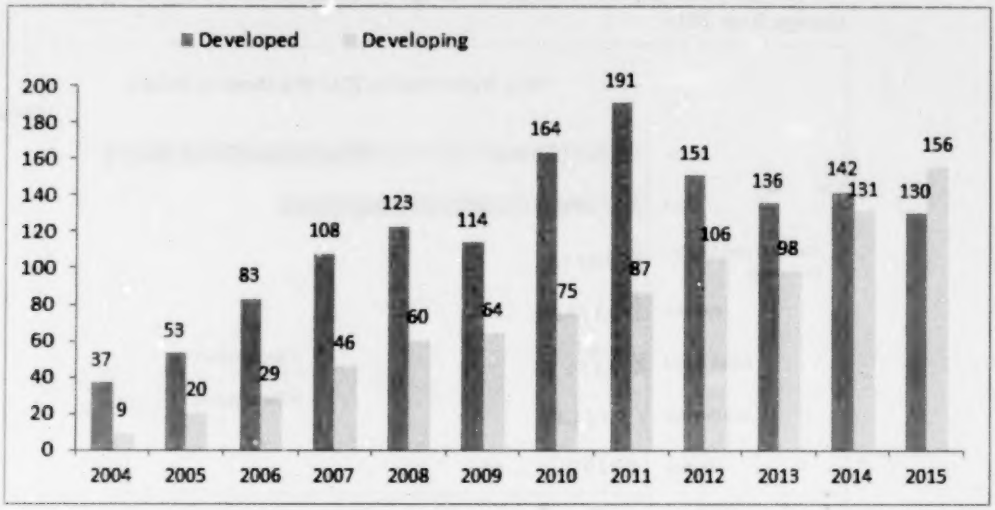
Source: UNEP and Bloomberg New Energy Finance, Global Trends in Renewable Energy Investment 2016 (Frankfurt, Frankfurt School of Finance and Management, 2016).

40. In 2015, for the first time, investments in renewables in developing countries outweighed those in developed economies. The developing world, including Brazil, China and India, committed a total of $156 billion, up 19 per cent from 2014, while developed countries invested $130 billion, down 8 per cent.[5]

41. China was by far the largest investing country for renewables (excluding large hydro), with $102.9 billion in 2015, representing well over a third of the global total. The United States was a distant second with $44.1 billion; Japan was a clear third with $36.2 billion, followed at a distance by the United Kingdom of Great Britain and Northern Ireland and India at $22.2 billion and $10.2 billion, respectively.

42. Figure IX shows global new investment in renewable energy for developing and developed countries for the period 2004-2015. Developing countries have increased their performance almost steadily over the past years, while investment in developed countries peaked in 2011, aided by the "green stimulus" programmes in the solar boom of the United States and Germany.[5] Developed country investments are now 47 per cent lower than in 2011.

Figure IX
Global new investment in renewable energy, 2004-2015 (in billions of dollars)



Source: *UNEP and Bloomberg New Energy Finance, Global Trends in Renewable Energy Investment 2016* (Frankfurt, Frankfurt School of Finance and Management, 2016).

III. Promotion of new and renewable sources of energy

A. Sustainable Development Goal 7 and the Sustainable Energy for All initiative

43. The General Assembly adopted the 2030 Agenda for Sustainable Development in September 2015 (see resolution 70/1), which includes a stand-alone sustainable development goal on energy. Sustainable Development Goal 7 aims to "Ensure access to affordable, reliable, sustainable and modern energy for all" and confirms the importance of energy as a key enabler of sustainable development for all countries and all people. The launch of the Secretary-General's initiative on "Sustainable Energy for All" in 2011 and the declaration of 2014-2024 as the United Nations Decade of Sustainable Energy for All have also given strong momentum to the promotion of renewable energy.[13] The remarkable support by an unparalleled network of leaders from all sectors of society and the ample mobilization of a plethora of stakeholders ensure that progress on the initiative's three interlinked objectives — which also fall in line with the targets of energy Sustainable Development Goal 7 — is made at an accelerated pace.

44. So far, over 100 developing countries have "opted in" and joined the efforts of SE4All. Over 50 High Impact Opportunities (HIOs) have been identified, encompassing a wide range of stakeholders who undertake actions that will have significant potential to advance SE4ALL and its goals. Progress is being reported by many countries, including Brazil, Ethiopia, Ghana, Liberia, Nicaragua and Sierra

[13] For more information, see www.se4all.org.

Leone. Some of the progress in the different countries results from partnerships with institutions or initiatives such as the World Bank, Energy+, the United Nations Foundation and the Inter-American Development Bank.

45. In May 2015, the second annual SE4ALL Forum was held to assess progress, mobilize further action, partnerships and commitments, share best practices and showcase innovation. The Forum brought together more than 1,500 leaders from all sectors and countries, including more than 30 Ministers of Energy and Finance from all around the world. The emphasis of the Forum was on showcasing concrete and substantial outcomes, including the launch of the annual report of SE4ALL for 2014, as well as scores of commitments announced by partners working towards the targets. The Forum also hosted the launch of the second edition of the biennial *Global Tracking Framework* (GTF).

46. The Global Tracking Framework is a global data platform and monitoring system designed to allow rigorous and transparent monitoring of progress towards the three major SE4ALL objectives through 2030. A consortium of 20 agencies, including the Department of Economic and Social Affairs, co-led by the World Bank and the International Energy Agency, produced the second edition of the *Global Tracking Framework* report in 2015.

47. A new complementary theme of GTF 2015 provides analysis of the financial cost of meeting the SE4ALL objectives, as well as the geographical and technological distribution of the investments that need to be made. The report finds that in order to double the share of renewable energy in the global mix by 2030, annual global investments would need to increase to $442-$650 billion, thus implying an investment gap of $157-$365 billion with respect to current investments.

B. National efforts

48. As of year-end 2015, renewable energy targets had been established in 173 countries at the national or State/provincial level, and renewable energy policies could be found in 146 countries.[5]

49. Policymakers in many countries recognize the benefits of renewable energy and its positive impact on energy access, particularly as off-grid and mini-grid solutions in rural and remote areas. Owing to rapidly falling costs of these systems, they pose the most economically viable option for the electrification of rural and remote areas in most cases today. Furthermore, they serve as important enablers for health care, food security, water access, education, gender equality and job creation.

50. The most widely used renewable energy policy is the feed-in tariff (FIT) that is now in place in 75 countries. In 2015, no new countries added new feed-in policies for the first time since 2000. Other policy options are quotas, known as renewable portfolio standards (RPS), which are used in 26 countries. RPS policies remain popular at the subnational level. As of year-end 2015, RPS or quota policies were in place in 74 States/provinces/territories.[5]

51. Net metering or net billing policies were in force in 52 countries as of year-end 2015, and were utilized to support the deployment of small-scale, distributed renewable energy systems. Policymakers often put in place these policies together

with other policy mechanisms, such as feed-in tariffs or auctions that support larger-scale projects.[5]

52. Another increasingly utilized policy option is renewable energy tendering, also known as public competitive bidding or auctioning. These tenders can be technology-neutral or focused on a specific technology. As of year-end 2015, both forms have been held in a combined number of 64 countries.[5]

53. It is estimated that in 2015 around 126 countries had some form of financial support policy for renewable energy in place, including tax reductions, grants and low-interest loans. Notably, the United States approved multi-year extensions, the longest extensions to date, of its production and investment tax credits in late 2015, whereas El Salvador, India, Jordan, Mongolia and Pakistan all added new policies or extended existing ones.[5]

54. Many countries, especially those formerly at the forefront of renewable energy subsidies and feed-in tariffs — e.g., Germany, France and Poland — have been reducing their feed-in tariffs or shifting to renewable tenders. In addition, some countries reduced funding for renewables during 2015. Denmark, for example, lowered funding for the Energy Technology Development and Demonstration Programme.

55. Several renewable energy targets were set to be achieved by 2030, which led to a host of new commitments and adjusted targets. France established a target for a 38 per cent renewable heat share by 2030. Brazil pledged to increase the share of non-hydro renewable energy in its electricity generation mix to 20 per cent by 2030.[5]

56. France set a new target of 15 per cent renewables in final transport energy consumption by 2030; the Lao People's Democratic Republic aims to meet 10 per cent of its transport fuel demand with biofuels by 2025; Liberia seeks to blend up to 5 per cent palm oil biodiesel by 2030 for vehicle fuels; and Malawi set a goal of increasing the proportion of ethanol run vehicles to 20 per cent by 2020. The European Union revised its renewable energy act limiting crop-based biofuels to a 7 per cent share of the Union's 2020 10 per cent renewable transport energy target. Germany reduced its required blend volumes for biodiesel from 6.25 per cent to 3.5 per cent to bring the requirement in line with the targeted emissions reduction goals.

57. In Africa, the Congo, Eritrea, Gabon, Madagascar and Namibia established targets of 70 per cent or greater for electricity generation from renewable sources.

58. In 2015, the European Union built on its 2020 renewable energy targets by establishing a long-term objective of a minimum of 27 per cent of final energy consumption by 2030, whereas France announced a national target of 40 per cent for electricity generation.

59. In the Americas, some of the world's highest renewable power share targets were set. Costa Rica is aiming for 100 per cent renewable power by 2030, Uruguay 95 per cent by 2017, Belize 85 per cent by 2027, Guatemala 80 per cent by 2030, and Bolivia 79 per cent by 2030. Paraguay aims to achieve a 60 per cent increase by 2030.

60. The Group of 20 (G-20) endorsed the Toolkit of Voluntary Options for Renewable Energy Deployment, thus paving the way for the Group to advance the global renewable energy agenda. G-20 countries hold 75 per cent of total

deployment potential for all renewables in the energy sector and around 70 per cent of total investment potential for renewable power between 2016 and 2030.

61. The United States pledged to cut net greenhouse gas emissions by 32 per cent by 2030, while China announced its goal of peaking CO_2 emissions and expanding the share of its total energy consumption coming from zero-emission technologies by 2030.[14] The Covenant of Mayors for Climate and Energy — a group of mainly European, and some African and Asian mayors — pledged to reduce CO_2 emissions by at least 40 per cent and to adopt an integrated approach to tackling mitigation and adaptation to climate change.[15]

62. A growing number of cities, States and regions are committing themselves to a transition to 100 per cent renewable energy in individual sectors of the economy or in the economy as a whole. Byron Shire, Coffs Harbour and Uralla in Australia; Oxford County and Vancouver in Canada; and the United States cities of Rochester (Minnesota) and San Diego (California) are planning to generate their energy requirements from 100 per cent renewable sources. Some cities in the United States have already reached 100 per cent renewable electricity, including the cities of Burlington (Vermont), Aspen (Colorado) and Greensburg (Kansas).

C. International institutional efforts

63. Organizations of the United Nations system continue to support the promotion and expansion of new and renewable sources of energy in developing countries. In 2015 and beyond, the SE4ALL initiative, the Paris Agreement and the 2030 Agenda for Sustainable Development are all bringing greater attention and awareness to the important issues of universal energy access, energy efficiency and the promotion of new and renewable sources of energy.

64. The United Nations Development Programme (UNDP) is involved in many activities promoting the use of new and renewable sources of energy. UNDP, in collaboration with key partners, provides technical advice to develop specific sustainable energy solutions, especially related to "bottom up" decentralized energy options. Support by UNDP for new and renewable energy has included the establishment of national targets and policy frameworks for renewable energy and energy efficiency, and developing regulatory frameworks that provide technical regulations and conditions for the installation of renewable energy generation plants and their connection to the grid. UNDP will design and implement financial mechanisms and incentive schemes to lower risks of clean energy investment, especially at the community level, which may include setting up enabling mechanisms such as feed-in tariffs, supporting local microfinance organizations, or establishing dedicated national clean energy climate funds. UNDP seeks to develop local manufacturing, engineering, operation and maintenance capabilities along the energy supply chain, and strengthen the capacity of national and local governments to implement, coordinate and monitor the results of clean energy policies.

[14] The White House, *Fact Sheet: The United States and China Issue Joint Presidential Statement on Climate Change with New Domestic Policy Commitments and a Common Vision for an Ambitious Global Climate Agreement in Paris* (Office of the Press Secretary, September 2015).

[15] *Covenant of Mayors for Climate and Energy*; see www.covenantofmayors.eu.

65. The World Meteorological Organization (WMO) recognized that with increased climate variability and change, the sensitivity of the energy sector to weather and climate will increase, and thus the demand for climate services for energy. At its seventeenth session, held in June 2015, the World Meteorological Congress (Cg-17) adopted energy as an additional priority area of the Global Framework for Climate Services (GFCS). The Framework will promote the use of climate information for sustainable development and environmental stewardship. WMO is also partnering with the International Renewable Energy Agency (IRENA) to develop the Global Solar and Wind Atlas. This work is intended to create a high-quality, Internet-based platform that will raise awareness of technology opportunities to limit the financial risk of countries and of investors.

66. The efforts of the Food and Agriculture Organization of the United Nations (FAO) focus on the Energy-Smart Food for People and Climate programme and the work on sustainable bioenergy. The energy-smart food systems programme promotes improved energy efficiency and diverse energy sources with gradual increase in the use of renewable energy in agriculture and food chains.

67. The United Nations Environment Programme (UNEP) Medium-Term Strategy 2014-2017 includes dedicated programmes and projects on renewable energy, energy efficiency, decentralized energy solutions, transport, buildings, cities, short-lived climate pollutants, sustainability criteria, networks and partnerships, and energy and climate finance.

68. The World Health Organization (WHO) has the global household energy database, which serves as the baseline for SE4ALL tracking of home energy transitions and health impacts.[16] The efforts of WHO have included producing documented evidence about health benefits of clean household fuels and technologies; completion of the "WHO Guidelines for indoor air quality: household fuel combustion" and the current development of a clean household energy policy planning tool which facilitates the adoption of clean fuels and technologies used in the home; coordinating efforts to enhance and harmonize national household surveys and censuses to tracking energy access in the home; and updating the WHO database on energy access in health-care facilities to include more recent surveys in Sub-Saharan Africa.

69. The United Nations Industrial Development Organization (UNIDO) has continued to promote sustainable energy solutions for Inclusive and Sustainable Industrial Development (ISID) of partner countries through delivery of technical assistance. In 2015, UNIDO's Sustainable Energy Portfolio totalled $275 million in grant funding, with $1.5 billion in planned co-financing, encompassing a wide coverage of more than 90 renewable energy, energy efficiency, and low-carbon technology programmes and projects.

70. The United Nations Conference on Trade and Development (UNCTAD) has introduced the energy commodity development programme, the natural resources information exchange and the biofuel initiative. UNCTAD works to address a number of issues, including obstacles to renewable energy trade and investment such as border energy tariffs and subsidies; the effect of government intervention on energy efficiency and prices; creating a level playing field between high-carbon and low-carbon investment alternatives; regional integration through grid

[16] See www.who.int/indoorair/health_impacts/he_database/en/index.html.

interconnection for energy security; market-grid access for low-carbon technologies; and regional cooperation in the area of infrastructure investment, operations and management.

71. The Economic and Social Commission for Asia and the Pacific (ESCAP), at its seventieth session, adopted resolution 70/9, which includes 15 areas of action that contribute directly to the efforts to achieve goals of SE4ALL in Asia and the Pacific, known as the Regional Plan of Action. ESCAP has been supporting the implementation of the Plan of Action through: (a) developing an annual regional trends report on energy for sustainable development in Asia and the Pacific; (b) developing an Asia-Pacific energy portal, an information platform for up-to-date statistical data and policy initiatives in the region; and (c) hosting an annual high-level policy dialogue, focusing on identifying solutions to key challenges and the potential establishment of working-level groups to support implementation of policy solutions.

72. The work of the Economic and Social Commission for Western Asia (ESCWA) on sustainable energy focuses on access to energy services, sustainable consumption and production and the promotion of renewable energy. ESCWA has been coordinating with the relevant ministries and authorities of Member States in addressing and responding to challenges by advocating better regional energy integration for added energy supply security, enhanced understanding of the influence of falling oil prices on sustainable development in the region, improved energy access in rural areas for more equitable growth, targeted policies and appropriate regulatory frameworks as well as innovative financing mechanisms and providing energy solutions to countries in conflict to strengthen their resilience.

73. The Department of Economic and Social Affairs of the Secretariat will continue to play a key role in the coordination of activities of UN-Energy. The Department provided key support during the intergovernmental negotiations on the definition of the Sustainable Development Goals, targets and indicators on energy for the 2030 Agenda. Through its Statistics Division and the Division for Sustainable Development, the Department is also supporting the Global Tracking Framework effort. The Department is leading a public-private partnership on "Minimum Electricity Access" that promotes electrification in rural isolated communities with stand-alone renewable energy systems. The partnership has already electrified four pilot schools in isolated rural areas in Bolivia using solar photovoltaic (PV) and solar thermal technologies.

74. In 2015, the Department of Economic and Social Affairs premiered a new partnership programme, titled "Powering the Future We Want: recognizing leadership and innovative practices in energy for sustainable development", offering a grant in the amount of $1 million to fund future capacity development activities in energy for sustainable development. The grant is awarded to an individual, institution or partnership based on past and current achievements, with the objective of promoting leadership and innovative practices in meeting the global energy challenge.

75. The strategy of the United Nations Educational, Scientific and Cultural Organization (UNESCO) includes assistance to Member States in enhancing the use of renewable energy technologies through effective policies and institutional frameworks. Under the UNESCO Global Renewable Energy Education and Training (GREET) programme, regional expert summer schools are organized annually for

the Africa and South-East Asia regions, which include training activities on renewable energy and related learning/teaching materials. UNESCO also launched a project that concerns the solar electrification of 75 rural schools in Benin, Madagascar, Mauritania, the Niger and Togo.

76. The United Nations Human Settlements Programme (UN-Habitat) focuses on several energy areas, including renewable energy technologies in the urban energy mix. To this end, UN-Habitat has projects on: (a) designing and implementing pilot renewable energy projects to enhance pro-poor access to water and sanitation; (b) promoting biogas in public institutions such as schools, prisons, hospitals and public spaces; (c) developing multifunctional clean energy centres, including a multitude of renewable energy technologies; (d) producing best-practice casebooks and technology road maps for renewable energy use in human settlements; and (e) designing sustainable municipal solid waste management systems, with an emphasis on producing energy from waste.

77. The International Renewable Energy Agency (IRENA) works towards mainstreaming renewable energy options and strategies in energy plans, increasing global access to renewable energy knowledge and improving policy frameworks and enabling market conditions for accelerated deployment of renewable energy. As the only global intergovernmental organization dedicated solely to renewable energy, and approaching universal membership, IRENA remains engaged in the efforts to translate the ambition of Sustainable Development Goal 7 into concrete, measurable steps that will help to attain this goal by 2030. IRENA launched its Roadmap for a Renewable Energy Future (REmap) 2030 during the first SE4ALL Forum in May 2014. REmap 2030 is a road map that identifies technology options, policy needs, and opportunities for international cooperation to double the global share of renewable energy by 2030. IRENA also published *Renewable Power Generation Costs in 2014* along with the second edition of *Renewable Energy and Jobs — Annual Review 2015*.

D. International financial institutions

78. International financial institutions continue to play an important role in mobilizing resources for the promotion of new and renewable energy. Multilateral development banks are committing more than $30 billion towards achieving the targets of energy Sustainable Development Goal 7 of the 2030 Agenda.

79. The World Bank Group has committed to doubling the leverage of its energy financing and to providing technical assistance to several SE4ALL opt-in countries. The Bank Group pursues a portfolio approach, which includes support for investments in power generation that are least-cost and sustainable, strengthen and expand transmission and distribution power networks; this approach improves efficiency through technical assistance and advisory services. The Bank Group is maintaining support for a wide range of energy projects, and its energy financing programmes and guarantees totalled $6.5 billion in fiscal year 2015. Of that amount, about $2.4 billion was for renewable energy and energy efficiency projects and programmes. Some of the notable programmes supported by the World Bank include: a solar park in Jordan; an off-grid electrification project in Bangladesh; a national electrification plan in Myanmar; the Lighting Africa Programme; and the SE4ALL Global Knowledge Hub, which includes the Global Tracking Framework,

the Multi-Tier Framework for Measuring Energy Access and Readiness for Investment in Sustainable Energy (RISE).

80. The African Development Bank plans to invest $20 billion in energy programmes by 2030. Investments range from regional to small- and medium-scale energy projects to increase electricity access in rural regions, including through its Sustainable Energy Fund for Africa (SEFA). The Fund is a $90-million multi-donor facility funded by the Governments of Denmark, the United Kingdom and the United States. It unlocks private investments in the sustainable energy agenda in Africa through: (a) grants to facilitate the preparation of medium-scale renewable energy generation and energy efficiency projects; (b) equity investments to bridge the financing gap for small- and medium-scale renewable energy generation projects; and (c) support to the public sector to improve the enabling environment. The SEFA project preparation and equity components currently represent an investment pipeline of US $711 million in investments and 230 megawatts.[17]

81. The European Bank for Reconstruction and Development (EBRD) has implemented more than 300 energy projects to date in Central and Eastern Europe and the southern and eastern Mediterranean, avoiding 19.6 million tons of CO_2 annually. EBRD has a total investment target of $30 billion, including co-financing with partners that supports SE4ALL goals. In 2014, sustainable energy investments accounted for 34 per cent of EBRD activities.

82. The Global Environment Facility (GEF), as an operating entity of the financial mechanism of the United Nations Framework Convention on Climate Change, has invested over $1.2 billion in more than 200 renewable energy projects in almost 100 developing countries and economies in transition. The Facility has become the largest public sector renewable energy technology transfer mechanism in the world, with investments that have contributed to the installation of 3 GW electric and 2.8 GW thermal of renewable energy capacity, resulting in an estimated direct avoidance of 290 million tonnes of CO_2 emissions over time.

83. The United Nations Capital Development Fund (UNCDF) CleanStart Programme provides microfinancing to low-income households for clean energy solutions. The objective is to provide 2.5 million people with cleaner, more efficient energy by 2017. The Programme has a budget of $60 million that can potentially reduce 300,000 tons of CO_2.

IV. Conclusions

84. New and renewable energy can fuel a future of opportunity and greater prosperity for addressing global challenges, including universal energy access, energy security, climate change and, ultimately, poverty eradication and sustainable development.

85. 2014 and 2015 were two sequent years of decoupling between emissions and GDP growth, in which renewable energy played an important role. In 2015, a new record for global dollar investments in renewable energy was also set. That rebound was attributed to new capacity added and the record-breaking investments made in

[17] African Development Bank, *Sustainable Energy Fund for Africa: Annual Report 2015* (Côte d'Ivoire, 2016).

developing countries. This growth was mainly driven by climate change policies and improved cost-competitiveness.

86. In 2015, renewables demonstrated their potential to satisfy energy requirements and successfully replace conventional energy sources in the long run, as for the first time renewable additions, excluding large hydro, represented the largest share in world electricity generation. Meanwhile, renewable generation cost cuts continued owing to advances in renewable power generation technologies. In particular, the levelized cost of electricity of solar photovoltaic was reduced by half between 2010 and 2015. With rapid deployment of renewable energy systems in many developed and developing countries, new opportunities arise, despite a backdrop of plummeting oil, coal and gas prices that protected the competitive position of fossil fuel generation.

87. In spite of these positive signs, policy support for renewables remains inconsistent because of government shifting and changing policies in the face of new economic crises, leading to uncertainty among investors. In addition, the recent significant drop in fossil fuel prices may have more negative impacts on renewables. However, the universal adoption of the Paris Agreement and the 2030 Agenda for Sustainable Development provides policy signals and guidance to move the world towards reaching the energy Sustainable Development Goal by 2030.

88. Although renewable energy is growing rapidly, urgent action is required now to continue promoting global investments in renewable energy deployment and development, and to improve energy infrastructure and energy efficiency. In order to limit emissions from energy generation and to support the transition to clean energy systems, there is a need to increase investments in renewable energy deployment and development.

89. Reassuringly, greenhouse gas emissions have stayed on the path of decoupling from economic growth in the last two years, and increasing renewable energy shares and energy efficiency initiatives around the globe are important in this development.